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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/581,664

06/05/2006

Koji Hotta

12394/3

4560

23838 7590 07/01/2009

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EXAMINER

SANDVIK, BENJAMIN P

ART UNIT

PAPER NUMBER

2826

MAIL DATE

DELIVERY MODE

07/01/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/581,664	<b>Applicant(s)</b> HOTTA ET AL.	
	<b>Examiner</b> BENJAMIN P. SANDVIK	<b>Art Unit</b> 2826	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 15-27 is/are pending in the application.  
     4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15-17 is/are allowed.
- 6) ☒ Claim(s) 18-20 and 27 is/are rejected.
- 7) ☒ Claim(s) 21-26 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>6/5/2006</u> .  | 6) <input type="checkbox"/> Other: ____.                          |

## DETAILED ACTION

### *Claim Objections*

Claim 24 is objected to because of the following informalities: the limitation of multiple barrier layers lacks antecedent basis. Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 18-20 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Tomatsu et al (U.S. Patent #5998268).

With respect to **claim 18**, Tomatsu teaches an emitter electrode (Fig. 2, E/17 and Col 4 Ln 20); a top region of a second conductivity type connected to the emitter electrode (Fig. 2, 8; N-type); a deep region of the second conductivity type (Fig. 2, 4); an intermediate region of a first conductivity type connected to the emitter electrode (Fig. 2, 7), the intermediate region isolating the top region and the deep region; a collector region of the first conductivity type connected to the deep region, the collector region being isolated from the intermediate region by the deep region (Fig. 2, 2; P-type); a collector electrode connected to the collector region (Fig. 2, C/18); a gate electrode (Fig. 2, 11) facing a portion of the intermediate region via an insulating layer (Fig. 2, 10), the portion of the

intermediate region isolating the top region and the deep region; and a barrier region (Fig. 2, 13; P-type) comprising a semiconductor region of the first conductivity type formed within the intermediate region; wherein the barrier region has a higher concentration of impurities than the intermediate region (Fig. 2, region 13 is P+ and region 7 is P-), and the barrier region is formed along a boundary between the top region and the intermediate region (Fig. 2, regions 8 and 7), and is electrically connected to the emitter electrode (Fig. 2, 17).

With respect to **claim 19**, Tomatsu teaches that the thickness of the top region (Fig. 2, 8) is less than the thickness of the barrier region (Fig. 3, 13).

With respect to **claim 20**, Tomatsu teaches Tomatsu teaches an emitter electrode (Fig. 2, E/17 and Col 4 Ln 20); a top region of a second conductivity type connected to the emitter electrode (Fig. 2, 8; N-type); a deep region of the second conductivity type (Fig. 2, 4); an intermediate region of a first conductivity type connected to the emitter electrode (Fig. 2, 7), the intermediate region isolating the top region and the deep region; a collector region of the first conductivity type connected to the deep region, the collector region being isolated from the intermediate region by the deep region (Fig. 2, 2; P-type); a collector electrode connected to the collector region (Fig. 2, C/18); a gate electrode (Fig. 2, 11) facing a portion of the intermediate region via an insulating layer (Fig. 2, 10), the portion of the intermediate region isolating the top region and the deep region; and a plurality of barrier regions formed within the intermediate region (Fig. 2, regions 13 and 14 abutting the N-type regions 8);

wherein the barrier regions are distributed within the intermediate region along a direction extending between the top region and the deep region (Fig. 2, i.e. the direction from top to bottom of the depicted structure).

With respect to **claim 27**, Tomatsu teaches that the thickness of the top region (Fig. 2, 8) is less than the thickness of the barrier region (Fig. 3, 13)

### ***Allowable Subject Matter***

Claims 15-17 are allowed. The following is a statement of reasons for the indication of allowable subject matter: the best prior art of record does not teach or fairly suggest the claimed device having a second conductivity type barrier region formed in the intermediate region and in contact with a dense portion.

Claims 21-26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter: in regard to claims 21 and 24, the best prior art of record does not teach or fairly suggest the claimed arrangement of the dense portion and multiple barrier regions.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BENJAMIN P. SANDVIK whose telephone number is (571)272-8446. The examiner can normally be reached on Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ben P Sandvik/  
Examiner, Art Unit 2826